

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 23 JUN 2005

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Applicant's or agent's file reference PCT02/835	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/MX 02/00105	International filing date (day/month/year) 08.11.2002	Priority date (day/month/year) 08.11.2002
International Patent Classification (IPC) or both national classification and IPC C08F297/04		
Applicant DYNASOL ELASTOMERS S.A. DE C.V.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  04.06.2004	Date of completion of this report  22.06.2005
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Boletti, C  Telephone No. +49 89 2399-8527 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/MX 02/00105

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-13 as originally filed

**Claims, Numbers**

1-33 filed with telefax on 04.05.2005

**Drawings, Sheets**

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/MX 02/00105**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1,17
Inventive step (IS)	Yes: Claims	
	No: Claims	2-16,18-33
Industrial applicability (IA)	Yes: Claims	1-33
	No: Claims	

2. Citations and explanations

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/MX 02/00105

Reference is made to the following documents:

- D1: US 5428106 (see claims, col. 4, l. 56-62 and examples)
- D2: EP 0879836 (see claims, p. 3, l. 3-6, p. 4, l. 38-45 and examples)
- D3: US 4153647 (see claims 1, 2, col. 3, l. 21-25 and examples)
- D4: WO 00/63267 (see claims 1, 2, 12; p. 4, l. 32-36; Table on p. 37, ex. 3-8)

A composition consisting in a block copolymer that comprises as monomers an alkadiene and a vinyl aromatic compound, wherein the polydispersity (PD) of at least one block of the vinyl aromatic polymer is within the 1.01 to 4 interval is already known from D2 and D4. The block copolymer of D2 has been obtained by an anionic polymerisation process, namely by a process which leads to polymer having low PD. In this respect, it is assumed that the PD of the styrene block in the block copolymer of D2 falls within the range reported in claim 1.

A composition comprising 97-50 wt% of a vinyl aromatic monomer and 3-50 wt% of an impact-modifier material consisting in an alkadiene-vinyl aromatic block copolymer is known from D1 and D3.

Therefore, the subject-matter of claims 1 and 17 are not novel under art. 33(2) PCT. The subject-matter of claims 2-16 and 18-33 is either not novel with respect to D1-D3 or would not appear to be inventive with regard to these teachings (Art. 33 (2) and (3) PCT).

REPLACED BY  
ART 34 AEDTCLAIMS

1. A composition to produce impact-resistant thermoplastic materials of the type consisting in a block copolymer that comprises as monomers an alkadiene (conjugated diene) and a vinyl aromatic compound, characterized because, at least, one block of the vinyl aromatic compound in the copolymer is polydispersed.

2. A composition, in accordance with claim 1, further characterized in that polydispersity of, at least, one block of the vinyl aromatic polymer is within the 1.01 to 4 interval.

3. A composition, in accordance with claim 1, further characterized in that the molecular weight of, at least, one block of the vinyl aromatic monomer is within the 5,000 g/mol to 420,000 g/mol interval.

4. A composition, in accordance with claim 3, further characterized in that the molecular weight of, at least, one block of the vinyl aromatic monomer is within the 30,000 g/mol to 120,000 g/mol interval.

5. A composition, in accordance with claim 1, further characterized in that the copolymer blocks are selected among linear or radial blocks, perfect or partially randomized blocks with the general formula  $[B(B/S)S]_{(j)}-Z$ , where  $i, j = 1, 2, 3, \dots$ ;  $Z$  = residues of the coupling agent or finishing agent;  $S$  = vinyl aromatic monomer; and  $B$  = alkadiene.

6. A composition, in accordance with claim 5, further characterized in that the correspondent part of alkadiene may be totally or partially hydrogenated.

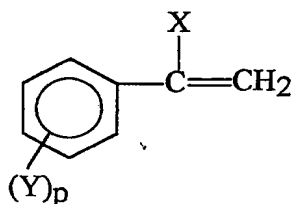
7. A composition, in accordance with claim 6, further characterized in that the B/S ratio is between 10/90 and 90/10.

8. A composition, in accordance with claim 7, further characterized in that the B/S ratio is between 20/80 and 80/20.

9. A composition, in accordance with claim 8, further characterized in that the B/S ratio is between 70/30 and 60/40.

10. A composition, in accordance with claim 1, further characterized in that the molecular weight of block copolymer is within the 100,000 g/mol to 450,000 g/mol interval.

11. A composition, in accordance with claim 1, further characterized in that the vinyl aromatic monomer is an ethylenic unsaturated compound with formula (I)



(I)

in which X represents one hydrogen or one alkyl radical with  $C_1-C_4$ ; p is zero or a whole number between 1 and 5; and Y represents a halogen or an alkyl radical with  $C_1-C_4$ .

12. A composition, in accordance with claim 11, further characterized in that the vinyl aromatic monomer is selected among vinyl toluene, styrene, methylstyrene<sup>o</sup>, mono-, di-, tri-, tetra- and pentachlorostyrene and the corresponding alpha-methylstyrene, alkylated styrenes in the core and the corresponding alpha-methylstyrenes; ortho- and para-methylstyrenes, ortho- and para-ethylstyrenes, ortho- and para-methyl-alpha-styrenes, and mixtures or combinations among them or with other copolymerizable monomers.

13. A composition in accordance with claim 12, further characterized in that the monomers copolymerizable with the vinyl aromatic monomer are selected among acrylic monomers, methacrylic monomers, acrylonitrile and maleic anhydride.

14. A composition, in accordance with claim 1, further characterized in that the alkadiene or conjugated diene has 4 to 8 carbon atoms in its molecule.

15. A composition, in accordance with claim 14, further characterized in that the alkadiene or conjugated diene is selected among 1,3-butadiene, isoprene, 2,3-dimethyl-1,3-butadiene, piperylene and mixtures among them.

16. A composition, in accordance with claim 1, further characterized in that the alkadiene or conjugated diene is 1,3-butadiene.

17. A composition, in accordance with claim 1, further characterized in that includes other coadjuvant agents selected among mineral oil, molecular weight regulators, antioxidants, pigments, charges and thermal stabilizers.

18. An impact-resistant thermoplastic composition of the type that comprises a vinyl aromatic monomer and an impact-modifier material consisting in a block copolymer that comprises as monomers an alkadiene (conjugated diene) and a vinyl aromatic compound, being such composition characterized in that comprises:

<sup>o</sup> Vinyl toluene and methylstyrene are synonyms; they have the same CAS No. 25013-15-4.

- A) 3 % to 50 % in weight of impact-modifier material, such material having, at least, one block of polydisperse vinyl aromatic compound.
- B) 97 % to 50 % in weight of the vinyl aromatic monomer.

19. A thermoplastic composition, in accordance with claim 18, further characterized in that the polydispersity of, at least, one block of the vinyl aromatic monomer of the impact-modifier material is within the 1.01 to 4 interval.

20. A thermoplastic composition, in accordance with claim 18, further characterized in that the molecular weight of, at least, one block of the vinyl aromatic monomer of the impact-modifier material is within the 5,000 g/mol to 420,000 g/mol interval.

21. A thermoplastic composition, in accordance with claim 20, further characterized in that the molecular weight of, at least, one block of the vinyl aromatic monomer of the impact-modifier material is within the 30,000 g/mol to 120,000 g/mol interval.

22. A thermoplastic composition, in accordance with claim 18, further characterized in that the copolymer blocks are selected among linear or radial blocks, perfect or partially randomized blocks with the general formula  $[B(B/S)S]_{(i)}-Z$ , where  $i, j = 1, 2, 3, \dots$ ;  $Z$  = residues of the coupling agent or finishing agent;  $S$  = vinyl aromatic monomer; and  $B$  = alkadiene.

23. A composition, in accordance with claim 22, further characterized in that the part corresponding to the alkadiene may be totally or partially hydrogenated.

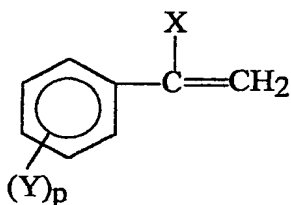
24. A composition, in accordance with claim 22, further characterized in that B/S ratio is between 10/90 and 90/10.

25. A composition, in accordance with claim 24, further characterized in that B/S ratio is between 20/80 and 80/20.

26. A composition, in accordance with claim 25, further characterized in that B/S ratio is between 70/30 and 60/40.

27. A thermoplastic composition, in accordance with claim 18, further characterized in that the molecular weight of block copolymer is within the 100,000 g/mol to 450,000 g/mol interval.

28. A thermoplastic composition, in accordance with claim 18, further characterized in that the vinyl aromatic monomer is an ethylenic unsaturated compound with formula (I)



(I)

in which X represents one hydrogen or one alkyl radical with  $C_1-C_4$ ; p is zero or a whole number between 1 and 5; and Y represents a halogen or an alkyl radical with  $C_1-C_4$ .

29. A composition, in accordance with claim 28, further characterized in that the vinyl aromatic monomer is selected among vinyl toluene, styrene, methylstyrene<sup>®</sup>, mono-, di-, tri-, tetra- and pentachlorostyrene and the corresponding alpha-methylstyrene, alkylated styrenes in the core and the corresponding alpha-methylstyrenes; ortho- and para-methylstyrenes, ortho- and para-ethylstyrenes, ortho- and para-methyl-alpha-styrenes, and mixtures or combinations among them or with other copolymerizable monomers.

30. A composition in accordance with claim 30<sup>®</sup>, further characterized in that the monomers copolymerizable with the vinyl aromatic monomer are selected among acrylic monomers, metacrylic, acrylonitrile and maleic anhydride.

31. A thermoplastic composition, in accordance with claim 18, further characterized in that the alkadiene or conjugated diene has 4 to 8 carbon atoms in its molecule.

32. A composition, in accordance with claim 31, further characterized in that the alkadiene or conjugated diene is selected among 1,3-butadiene, isoprene, 2,3-dimethyl-1,3-butadiene, piperylene and mixtures among them.

33. A thermoplastic composition, in accordance with claim 32, further characterized in that the alkadiene or conjugated diene is 1,3-butadiene.

34. A thermoplastic composition, in accordance with claim 18, further characterized in that includes other coadjuvant agents selected among mineral oil, molecular weight regulators, antioxidants, pigments, charges and thermal stabilizers.

<sup>®</sup> Vinyl toluene and methylstyrene are synonyms; they have the same CAS No. 25013-15-4.